machine in the previous figures will show that the extremities of the wings have been differently constructed, being composed at the ends of a series of feather-like sails. These latter are connected with a small machine, near the operator's body, which is driven by compressed carbonic acid gas; it is set in motion by a simple pressure of the finger. Such an addition has of course increased very considerably the weight and, therefore, the difficulty of handling the apparatus, and as yet it has only been used when the conditions were very suitable, as one serious fall would break up the machine.

Nevertheless the results up to now are very promising, and in calm weather Herr Lilienthal has been able to considerably prolong his flights. When, with the ordinary *sailing* machine, he would have come naturally down to the ground, he has found that an occasional flapping of these wings has helped to sustain him a longer time in the air, and to consequently cover greater distances.

Herr Lilienthal has shown now, that, with the simple sailing machine, flights can be made without any great risk. It would be good for the future progress of this mode of sailing if those interested in it, and who have the time and money, would take it up and pursue it further. What is wanted now is experience, and this can only be obtained by the co-operation of many workers.

PETERS—DENZA—RANYARD.

ASTRONOMICAL science has lost three of its votaries during the present month. Dr. C. F. W. Peters died on December 2, and Father F. Denza, as well as Mr. A. C. Ranyard, passed away on Friday last.

Dr. Carl Friedrich Wilhelm Peters, Director of the Königsberg Observatory, died on December 2, after a protracted illness. He was born on April 16, 1844, at the Pulkowa Observatory, where his father, Prof. C. A. F. Peters, held an appointment under the Russian Government. In 1849 his father was appointed to the Chair of Astronomy at Königsberg, and in 1854 he was made Director of the Altona Observatory, which was afterwards transferred to Kiel. The son studied astronomy and mathematics at Berlin, Kiel, München, and Göttingen, and was placed on the staff of the Hamburg and Altona Observatories. Between 1869 and 1872 he made some valuable pendulum observations, chiefly for the Prussian Government. As Privatdocent at Kiel University he undertook a long series of chronometer tests for the German Navy, in the course of which he proved that they are influenced by changes of humidity as well as by changes of temperature. In 1880, upon the death of his father, he edited the *Astronomische Nachrichten* for a year, after which he was appointed Extraordinary Professor at Kiel University. In 1883 he undertook the direction of the Naval Chronometric Observatory at Kiel, whence he proceeded in 1888 to the directorship at Königsberg, where he terminated a useful and laborious career.

Father F. Denza died at Rome on the 14th inst. from cerebral hæmorrhage. He was well known to the scientific world by his works in astronomy, meteorology, and terrestrial magnetism, and at the time of his death was President of the Italian Meteorological Society, and Director of the Observatory at Moncalieri, which he founded in 1859, as well as of the Vatican Observatory, which was established by the Pope in 1891. It was owing to the untiring energy of Father Denza that the *Corrispondenza Meteorologica Italiana* was established in connection with the Alpine Clubs, and that the results of observations at a large number of stations in the Alps and Apennines have been regularly published in the organ of the Italian Meteorological Society. He was elected an honorary member of the Royal Meteorological Society in 1870.

In astronomy his chief work relates to the observation of meteors. For several years he issued instructions to observers of meteors previous to every important shower, and he published numerous tables and papers on the observations carried on under his guidance, both in *Comptes-rendus* and the *Monthly Notices* of the Royal Astronomical Society. When the Directorship of the Vatican Observatory was taken by Father Denza a very comprehensive programme was drawn up, embracing investigations in meteorology, terrestrial magnetism, geodynamics, and astronomy. Observations in each of these branches of knowledge have increased in number every year since then, and the fourth volume of the *Pubblicazioni* of the Observatory, received by us on the same day as the news of Father Denza's death, is even greater in bulk than any of the previous ones. Father Denza was chiefly instrumental in making the Vatican Observatory one of those co-operating in the production of the photographic star-chart. He devoted his best energies to the advancement of the scheme, and to the progress of astronomical photography. The reports to which reference has been made, contain evidence of his knowledge of what had been done in other astronomical observatories, and of his ability to direct and further the advancement of celestial photography. His services to astronomy have earned for him an honoured place in our memory of the sons of science.

Mr. Ranyard was born in 1845. He was educated at Cambridge University, and was called to the Bar in 1871. He was one of the founders of the London Mathematical Society, of which he was originally joint secretary with Mr. George De Morgan, Prof. Augustus De Morgan being president. He became a Fellow of the Royal Astronomical Society in 1864. In 1870 he was assistant secretary of a joint committee of the Royal Society and the Astronomical Society, which organised the expedition despatched to Sicily, Spain, and Oran to observe the total solar eclipse of December 21. On his return to England he undertook to assist Sir G. B. Airy in the preparation of the report of the observations of the total eclipses both of 1870 and 1860. Ultimately Sir George Airy transferred the work entirely to Mr. Ranyard, and in 1880 the report was published by the Royal Astronomical Society as vol xli. of its "Memoirs." He observed the total eclipse of July 29, 1878, from Cherry Creek, near Denver, Colorado, and the total eclipse of May, 1882, from Sohag, in Upper Egypt. In addition to papers on the corona and matters connected with physical astronomy, he also published papers on the "Early History of the Achromatic Telescope," and on "Photographic Action." In conjunction with Lord Crawford and Balcarres, he undertook in 1872 a series of experiments on photographic irradiation; and in 1886 he demonstrated by a series of experiments that the intensity of photographic action varies directly as the brightness of the object photographed, and directly as the time of the exposure. The "Old and New Astronomy," designed by Mr. Proctor, was completed in 1892 by Mr. Ranyard, who contributed to it some very important sections on the structure of the stellar universe.

NOTES.

THE newly-discovered gas is to be the subject of a discussion at a meeting of the Royal Society on January 31, when Lord Rayleigh and Prof. Ramsay will present their paper. This will be the first meeting under a resolution of the Council of the Society passed last session, whereby certain meetings, not more than four in number, are to be devoted every year, each to the hearing and consideration of some one important communication, or to the discussion of some important topic.

At the request of the Ottoman Government, Dr. G. Agamennone, of the Italian Meteorological and Geodynamic Office, will shortly proceed to Constantinople to found there a seismological observatory of the first order. Amongst the instruments to be erected are an Agamennone seismometrograph and a tromometer similar to those in use in the principal Italian observatories. The tromometer will be provided with a photographic recording apparatus, and is specially adapted for registering the long-period pulsations from distant earthquake centres.

Directors of Botanic Gardens abroad will be glad to know that a list of seeds of hardy herbaceous annual and perennial plants and of hardy trees and shrubs which, for the most part, have ripened at Kew during the year 1894, is given in an appendix, recently issued, to the *Kew Bulletin*. These seeds are not sold to the general public, but are available for exchange with Colonial, Indian, and Foreign Botanic Gardens, as well as with regular correspondents of Kew. No application, except from remote colonial possessions, can be entertained by the Director of the Royal Gardens at Kew after the end of March.

The death is announced of Pafnutij Tchebitchef, the eminent Russian mathematician. He was a Foreign Member of the Royal Society, and an Associé Étranger of the Paris Academy of Sciences.

Dr. F. B. Hawkins died on December 7, at the great age of ninety-eight. He was elected a Fellow of the Royal Society sixty years ago, and was one of the oldest members of the medical profession.

The *Lancet* understands that the Premier has consented to receive a deputation to advocate the formation of a University for London on the lines recommended by the recent Royal Commission. The meeting will probably take place about the middle of January.

The Paris correspondent of the *Chemist and Druggist* reports that the Municipal Council have presented fifteen hundred francs to the École Normale Supérieure, to erect a bust of M. Pasteur in that college. The Council have also voted in favour of changing the name of the rue d'Ulm to that of "rue Pasteur."

At the invitation of the associated scientific clubs of Berlin, a numerous assembly met on Friday last in order to commemorate the great services rendered to science by the late Prof. von Helmholtz. The German Emperor and Empress, and many Ministers and members of Parliament, attended the ceremony.

Our Cambridge correspondent informs us that the Coutts Trotter Studentships in Physics at Trinity College have been awarded for two years to Mr. I. L. Tuckett, and for one year to Mr. S. W. J. Smith, both being scholars of the College.

The Council of the Marine Biological Association has appointed Mr. E. J. Allen to be director of the Plymouth laboratory, in succession to Mr. E. J. Bles, who lately resigned that position. Mr. Allen is a pupil of Prof F. E. Schultze, of Berlin, and has been engaged in researches upon the cœlomic and nervous systems of Crustacea, some interesting results of which were recently noticed in our columns.

Arrangements have been made to begin the new series of *Science* on the first day of the new year, under wholly different direction and auspices. The New York *Nation* says that the paper will hereafter be under the control of a representative editorial committee, and will undertake to report on the progress of science for men of science. The managing committee is constituted as follows:—Mathematics, Prof. Simon Newcomb; Mechanics, Prof. R. S. Woodward; Astronomy, Prof. E. C. Pickering; Chemistry, Prof. Remsen; Physiography, Prof. W. M. Davis; Palæontology, Prof. O. C. Marsh; Morphology, Prof. W. K. Brooks; Zoology, Dr. C. Hart Merriam; Botany, Prof. N. L. Britton; Hygiene, Dr. J. S. Billings; Physiology, Dr. H. P. Bowditch; Ethnology, Dr. J. W. Powell; Anthropology, Dr. D. G. Brinton; Psychology, Prof. Cattell.

The Organising Committee of the International Geographical Congress have issued an invitation circular to members of geographical societies, and all who take an interest in any of the various aspects of geography, to attend the meetings of the Sixth International Geographical Congress, which will be held in London from July 26 to August 23, 1895. The subjects to be dealt with at the Congress will be grouped under the following heads:—(1) Mathematical Geography; (2) Physical Geography, including Oceanography and Geographical Distribution; (3) Cartography; (4) Exploration; (5) Descriptive Geography; (6) Historical Geography; (7) Applied Geography, including Anthropo-Geography; (8) Education. Intending contributors of papers should send in their communications (written in English, French, German, or Italian) before the end of next April. An exhibition of instruments, maps, globes, photographs, and other objects representative of the present state and past history of geographical science, will be held in connection with the Congress.

Dr. E. de Tellenberg writes to us, from the Natural History Museum at Berne, with reference to a communication made by Sir John Lubbock to the Geological Society, on November 7 (Nature, vol. li. p. 94), on some nummulites from the valley of Lauterbrunnen at Murren. Sir John Lubbock remarked that "the find will necessitate a substantial correction of the geological map"; but Dr. de Tellenberg says that the nummulitic layer described was known long ago, and is shown on several geological maps; while the conclusion, that the rock is "not Malm, but Eocene," appears to have been arrived at fifty years ago.

In a presidential address to the members of the Tyneside Naturalists' Field Club, just received, Prof. G. S. Brady gives an interesting sketch of the present state of fisheries and fish-culture in Great Britain. He describes a visit to Mr. Armistead's successful salmon and trout hatchery near New Abbey, and recommends the foundation of a hatchery on the Northumberland coast to aid in keeping up and improving the supply of sea-fish, and of a biological laboratory attached to it for the scientific study of the marine fauna of the neighbourhood. We hope that everyone interested in the maintenance of our sea-fisheries, and in the study of marine biology in the north-east of England, will cordially assist in the realisation of this timely proposal. A work of this kind, as Prof. Brady suggests, comes fairly within the powers of the County Councils, which have already shown a commendable care for the interests of agriculture, and a desire generally to help forward technical and scientific education.

The current number of the *Bollettino mensuale* of the Italian Meteorological Society contains a summary, by Profs. A. Bartoli and E. Stracciati, of their determinations of the absorption of solar radiation by fog and by cirrus clouds. The investigations were very carefully conducted, and the results are therefore of considerable interest. It was found that a veil of cirrus was able to intercept as much as 30 per cent. of the sun's rays; while a slight fog, equally diffused in all directions, intercepted from 58 to 92 per cent. of the solar rays, which would have been transmitted with a perfectly clear sky. Full particulars of the numerous experiments made by the authors since the year 1885 will be found in the *Proceedings* of the Royal Institute of Lombardy of July 19 last.

THE Pilot Chart of the North Atlantic Ocean shows that the weather over that ocean during November was very severe. From the 9th to the 23rd of the month there were only two days of good weather between Newfoundland and this country. An appendix to the chart gives the synoptic weather conditions of the North Atlantic north of the 35th parallel for six consecutive days (September 28 to October 3) for the hour of Greenwich noon, showing the positions and behaviour of the various storms which were prevalent at that time. The excellent system adopted by the United States authorities for the collection and discussion of observations made at sea has enabled them to produce this synoptic chart so soon after date. We notice, however, that in the description of the storm signals used in various countries the "cylinder" or "drum" is referred to as now being employed by this country, but as a matter of fact it has not been used for many years.

IN *La Nature* of the 1st instant, M. de Nansouty gives an account of some interesting experiments by M. Kœchlin on the Eiffel Tower, with the view of measuring the force of the wind by the use of metal blocks whose resistance had been previously tested in the laboratory by means of compressed air. During the storm of November 12 last, the velocity anemometers registered 100 miles in the hour, and according to the formula used for the conversion of velocity into pressure, the blocks indicating a pressure of 200 kilograms ought to have been overturned, but only those indicating a pressure of 100 kilograms were displaced. From this, M. Kœchlin concludes that the formula gives results about 40 per cent. too high. It appears to us that the experiments afford a remarkable confirmation of Mr. W. H. Dines's recent investigations of anemometrical constants, in which he found that the usual theory of the cups moving with one-third of the wind's velocity gave values which were about 30 per cent. too high. Experiments very similar to those of M. Kœchlin were made by Mr. G. Dines some years ago, under less favourable conditions. but with nearly similar results.

A PICTURE-PUZZLE of a remarkable kind appears in the *Zoologist* for December. It is a reproduction of two photographs of a Little Bittern, showing the strange attitudes assumed by the bird to favour its concealment. One of the figures shows the bird standing in a reed-bed, erect, with neck stretched out and beak pointing upwards; and in this position, it is difficult to distinguish the bird at all from the reeds. The eye is deceived in a similar manner when the bird is crouching against a tree-stump at the river-side. Mr. J. E. Harting thinks that the curious attitudes adopted by the bird, on finding itself observed, are assumed in the exercise of the instinct of self-preservation. He mentions a similar habit, observed and described by Mr. W. H. Hudson, in the case of a South American Little Heron, which frequents the borders of the La Plata, and is occasionally found in the reed-beds scattered over the pampas. Without the aid of dogs, it was found impossible to secure any specimens of this bird, even after marking the spot where one had alighted.

THE architecture and sculpture of Gastropod shells has often arrested the attention of naturalists, for, in spite of the infinite variety of form assumed by the shell, it is in most cases extremely difficult to perceive any special utility in the nature of the modifications. A paper by Mr. W. H. Dall, however, in a recent number of the *American Naturalist* (No. 335), certainly tends to clear up two sets of these phenomena, viz. the ridges or plications of the columella, and the liræ or teeth of the outer lip. The author shows that among the fusiform rachiglossa the retractor or columellar muscle is longer, and attached deeper within the shell in the plicated (*e.g. Mitra*) than in the non-plicated forms (*e.g. Fusus*). The result of this is that in the former the mantle during contraction is withdrawn into a part of the shell too narrow to admit it in its normal shape. The mantle must wrinkle longitudinally; and the longitudinal shelly ridges on the pillar and towards the aperture of the shell are the mechanical consequences of this plication of the secreting surface. Similarly in forms possessing a very extensive mantle (*Volutidæ, Cypræidæ*) it may be noticed that the outer lip of the shell is toothed chiefly in those types in which the aperture is small, and that the denticulation is less marked as the aperture becomes larger. This is attributed by Mr. Dall to the fact that as the aperture becomes reduced the mantle must become increasingly wrinkled at its exit from the shell, thus causing the deposition of teeth and liræ on the outer lip (*c.f. Cypræa*). If these features fall under Prof. Lankester's category of "responsive characters," the question arises whether the whole molluscan shell, so far as its shape and sculpture is concerned, is not simply a combination of such characters.

THE first number of a series of hand-lists of the collections of living plants cultivated in the Royal Gardens, Kew, has just been received. This part, which contains a list of *Polypetalæ*, shows that the complete catalogue will be of the highest service in helping to establish a uniform system of nomenclature. An immense number of "trade" or "garden" names have been reduced to their proper synonyms, and as the woody plants (shrubs and trees), grown in the open air, are particularly liable to confusion in gardens, and in nurserymen's catalogues, the present list is most acceptable. It can easily be understood that the list "represents the work of many years, and has only been accomplished with considerable labour." From the preface we learn that, of the twenty thousand species and distinct varieties of plants cultivated at Kew, three thousand are hardy shrubs or trees. The first catalogue of plants cultivated at Kew, published in 1768, contained 3389 species, of which 488 were hardy trees and shrubs. The two Aiton's published similar lists, but that issued by the younger Aiton early in this century, and containing about eleven thousand species, was the latest comprehensive list of plants in cultivation at Kew, though lists of special collections have been published from time to time. The great importance of the series of hand-lists, which Mr. Thiselton-Dyer has instituted, will therefore be at once understood.

THE twenty-sixth volume of the *Memoirs* of the Russian Geographical Society (General Geography) contains an important work by Prof. Mushketoff and A. Orloff, being a catalogue of all the earthquakes which are known to have taken place in the Russian empire and the adjoining territories of China, Turkestan, Persia, and Asia Minor from the year 596 B.C. till the year 1887. The list comprises no less than 2400 separate earthquakes, of which 710 took place in China, 569 in East Siberia, 36 in West Siberia, 202 in Central Asia, 590 in Caucasia, 121 in North Persia and Asia Minor, and 188 in European Russia and Finland. These figures alone, if compared with those for China in the catalogues of R. Mallet, A. Perrey, and Fuchs, give an idea of the richness of the Russian catalogue. As to Russia, Siberia, and Turkestan, the catalogue is replete with entirely new data. Most of the earthquakes of the last two centuries, for which we possess full accounts, given by careful observers, are described at some length, and some of the descriptions, especially for the earth tremors of Shemakha, Lake Baikal, and Turkestan, are of great value. A map showing the distribution of the earthquakes over the territory, and diagrams showing their frequency during the different months, accompany this most valuable work.

A PAPER on the various more or less phantastic forms assumed by combinations of alkalies with oleic acid when brought into contact with water, is contributed to the current number of *Wiedemann's Annalen*, by Dr. G. Quincke. Oleic acid with little alkali, or containing an acid oleate of an alkali in solution, form in much water hollow spheres, globules, and foam, with walls of liquid oleic acid. The hollow spaces are filled with aqueous soap solution. When more water is added, the walls are covered with a solid skin of the acid oleate, which may then become quite liquid again by decomposition into liquid oleic acid and aqueous soap solution. The periodic flow of soap solution at the surface separating liquid oleic acid and water produces vortex motions, which may be made evident with methylene blue or other colouring matter. More hollow spheres and bubbles of oleic acid are formed, which are arranged by the capillary forces on the larger bubbles in definite positions, such as straight lines, circles, and ellipses. Dr. Quincke points out the remarkable analogy between this arrangement and the configuration of various small portions of the stellar universe, such as portions of Orion, Virgo, and Coma Berenice's, and recalls Plateau's experiments with weightless oil spheres illustrative of the generation of the solar system. He also emphasises the fact that the protoplasm of the organic world shows a structure and motions similar to those of oil foam with liquid or solid surfaces.

UNDER the title, "Science Teaching; an Ideal, and some Realities," Mr. H. G. Wells delivered a lecture at the College of Preceptors last week. Much attention is now being given to the methods of science teaching in our elementary schools and colleges, and Mr. Wells' views on the subject are sound enough to be taken into consideration. In the course of his lecture, he pointed out that a rational course of science should grow naturally out of kindergarten. This should lead to object-lessons proper, and demonstrations in physics and chemistry may be made to grow insensibly, without any formal beginning, out of such lessons. The best, about the only permanently valuable, preparation for a scientific calling that can be given to a boy in a secondary school, is the broad basis of physics and chemistry led up to in this way.

THE 1895 *Annuaire* of the Montsouris Observatory—the Observatory of the Paris Municipal Council—has been published. Though the observations made at the Observatory have special reference to the climatology and hygiene of Paris, researches into the domains of pure science are carried on. M. Léon Descroix has charge of the physical and meteorological service, and M. Albert-Lévy of the chemical part of the work. This department includes the study of the variations in the chemical composition of the air in various parts of Paris, and of rain and river waters. The third branch of the work, dealing with micro-organisms, is under the direction of Dr. Miquel, who contributes to the *Annuaire* his sixteenth memoir on the organic matter found in air and water.

THE papers read at meetings of the Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne, and the Tyneside Naturalists' Field Club, during the past two years, have just been published in the Society's *Transactions*, vol. xi. part ii. Among them is an address by the President, Prof. G. S. Brady, F.R.S., on the life-history and character of some internal parasites, and a lecture on parasitism in plants and animals. The latter forms one of a series of reports of five lectures given in the Museum of the Society; the others being "On the Egg," by Dr. D. Embleton; "Frogs and Tadpoles," by Prof. M. C. Potter; "The Structure of Timber," by Dr. W. Somerville; and "Germs," by Mr. H. De Haviland. The Society appears to be in a far more flourishing condition than most provincial societies.

SEVERAL new editions of scientific books have been received during the past week. Prof. Richard Hertwig's "Lehrbuch der Zoologie" (Gustav Fischer, Jena) is one of these. The original edition was reviewed in NATURE in June 1893 (vol. xlviii. p. 173), and we have nothing to add to the remarks then made, except that the work has been improved by revision. We are glad to see that Mr. Cumming's "Introduction to the Theory of Electricity" (Macmillan) has reached a fourth edition. The chief additions to the new issue are articles upon the magnetic circuit and on the dynamo. "Symbolic Logic," by Dr. John Venn, F.R.S. (Macmillan), has survived the prejudices of anti-mathematical logicians, for a second edition, revised and rewritten, has just appeared. Finally, Messrs. Whittaker and Co., have issued a second edition of "The Electro-Platers' Handbook," by Mr. G. E. Bonney. This useful manual has been enlarged by an additional chapter on electrotyping, and by a number of short sections on new methods of interest to amateurs and young students of electro-metallurgy.

A BULLETIN (really a volume of 259 pages), by Mr. J. E. Spurr, has come to us from the Geological and Natural History Survey of Minnesota. The subject is "The Iron-Bearing Rocks of the Mesabi Range in Minnesota," and the author treats it from many points of view. A number of reproductions of the appearances presented by thin sections of the rocks when microscopically examined, accompany the memoir. The matter is not merely descriptive of the general structure and characteristics of the Mesabi iron-bearing rocks; if it were, it would only be of local interest. Space is given to the statement of theories to account for the origin of rocks of the kind described—a subject which is still one of doubt, discussion, and speculation. In this connection the origin of glauconite is dealt with. An examination of a thin section, with a view to finding whether the forms in which the glauconitic grains sometimes occur have any resemblance to organic forms, led to a negative result. Mr. Spurr thinks it possible, however, that further study of more favourable sections may result in finding traces of the organisms which possibly once existed in the rocks investigated. His work throws new light upon several perplexing problems in economic geology.

ANHYDROUS hydrogen peroxide has at last been isolated by Dr. Wolffenstein in the laboratory of the Technischen Hochschule at Berlin, and the somewhat surprising fact demonstrated that this substance, which has hitherto been regarded as possessing but little stability, is capable of actual distillation with scarcely any loss under reduced pressure. In attempting to concentrate solutions of hydrogen peroxide *in vacuo* by the method of Talbot and Moody, and also in the open air upon the water bath, a solution as strong as 66 per cent. H_2O_2 was obtained, but with a loss of over 70 per cent. of the original amount of peroxide employed. Moreover, it was found that when the common commercial 3 per cent. solution is concentrated, the percentage of H_2O_2 may be brought up to 45 without the loss of any considerable quantity of the peroxide by volatilisation, but that as the concentration continues to rise above this limit the volatilisation of the peroxide increases at a very rapid rate. For the great loss was proved not to be due to decomposition, but to actual vapourisation of the substance. Evidently hydrogen peroxide is remarkably stable at the temperature of a water bath. An attempt was therefore made to actually distil it under reduced pressure. A quantity of commercial peroxide which had been further concentrated until it contained about 50 per cent. H_2O_2 was first purified from all traces of suspended impurities, and at the same time still further concentrated, by extraction with ether; after evaporation of the ether the solution was found to contain 73 per cent. H_2O_2.

This solution was then submitted to distillation at the temperature of the water bath and under the reduced pressure of 68 m.m. of mercury. The distillate was received in two-fractions, boiling at 71°–81° and 81°–85° respectively. The first fraction contained 44 per cent. H_2O_2, while the latter was found to contain no less than 90·5 per cent. Upon again fractionally distilling the latter product, a large proportion distilled at 84°–85°, and this fraction proved to be practically pure H_2O_2, containing over 99 per cent. of the peroxide. The liquid thus isolated is a colourless syrup which exhibits but little inclination to wet the surface of the containing vessel. When exposed to the air it evaporates. It produces a prickly sensation when placed upon the skin, and causes the appearance of white spots which take several hours to disappear again. As regards the much-discussed and disputed question of the reaction of hydrogen peroxide towards litmus, Dr. Wolffenstein finds that even when the pure liquid is made strongly alkaline with soda and again distilled, the distillate exhibits strong acid characters, so that the acid nature of hydrogen peroxide must be regarded as fully established. It is finally shown that the use of ether in assisting the concentration is by no means essential. Ordinary commercial 3 per cent. peroxide can be immediately subjected to fractional distillation under reduced pressure, and a fraction eventually isolated, consisting of the pure substance boiling at 84°–85° under a pressure of 68 m.m.

THE additions to the Zoological Society's Gardens during the past week include a Common Fox (*Canis vulpes*), British, presented by Mr. Harold von Löhr; a Spotted Ichneumon (*Herpestes nepalensis*) from India, presented by the Misses Violet and Sylvia Brockelbank; two Curlews (*Numenius arquata*), British, purchased.

OUR ASTRONOMICAL COLUMN.

SECULAR VARIATIONS OF THE INTERIOR PLANETS.—As far back as 1859, Leverrier discovered that the movement of the perihelion point of the orbit of Mercury was greater than could be accounted for by the action of all the known planets, and he attributed this to the effect of a group of unknown bodies circulating between the orbit of Mercury and the sun. Prof. Newcomb has recently gone over the ground again, and the results of his work are given in *Comptes-rendus* of December 10. A brief statement of the tentative conclusions arrived at was given in these columns on November 29 (p. 114). From a discussion of a vast number of observations he has redetermined the secular variations for the orbits of Mercury, Venus, the Earth, and Mars, and he has computed the masses of Mercury, Venus, and Jupiter from the periodical perturbations which they produce; the adopted value of the earth's mass is deduced from the parallax $8''·80$, and for Mars the adopted mass is that derived from observations of the satellites. It is then shown that with these masses the calculated values of the secular variations differ from the observed ones, the divergences being especially great in the movements of the perihelia of the orbits of Mercury and Mars, and of the node of Venus. Two explanations of the differences are open to us: (1) It may be supposed, as suggested by Prof. Asaph Hall, that the law of gravitational attraction is not strictly true, and that the attractive force of the sun varies inversely as the distance raised to the power of approximately 2·000000 1574; (2) they may be attributed to the influence of unknown masses of matter.

At first sight, the second hypothesis seems preferable, as it involves no departure from an accepted law, and because it is the only one which will explain all the secular variations, while on the first hypothesis the perihelia would alone be affected. If there are unknown bodies between Mercury and the sun, Prof. Newcomb shows that in order to produce the observed effects, their mass must be great enough to produce a sensible ellipticity in the sun's figure; and as this has not been detected, he prefers to place these unknown bodies between the orbits of Mercury and Venus. He has computed the elements of an orbit which would reduce all the discrepancies between observed and calculated values of the secular variations to less than the probable errors, the mean distance being 0·48, and the mass 1/37,000,000 th that of the sun. At the same time, Prof. Newcomb regards this result more as a curiosity than as a reality, as it seems improbable that such a group of bodies should have escaped discovery.

Returning to the other hypothesis, he finds that if we accept Hall's modification of the law of gravitation, which accounts for the movements of the perihelia, the variations of the other elements can all be explained by slightly changing the value of the earth's mass. The new value corresponds to a solar parallax of $8''·77$. Although by no means regarding the latter hypothesis as established, Prof. Newcomb is inclined to adopt it provisionally.

IRREGULARITIES IN VARIABLE STARS.—In a summary of the observations of variable stars of long period, made by W. Maxwell Reed at Harvard College Observatory and the Abbot Academy (*Astron. Journ.* No. 330), the importance of studying the irregularities in the light curves is strongly insisted upon. The observations indicate numerous "stand-stills," or notches in the light-curves, and these are believed to be secondary phases produced by additions of light at those points. "A record of over ten years for T Cephei gives ten more or less well-defined stand-stills. The mean period is about twenty days less than that of the variable (about 383 days)." From studying these and other variables, Mr. Reed is inclined to believe that "the light-curve, in some cases at least, is the sum of two or more curves—each component curve having a different range, period, and character from the others. By such a hypothesis one can account for the changes in period and range of a variable, and the presence of "stand-stills" and secondary phases. Unfortunately, there is not enough evidence yet to give the elements of the two or more component curves for T Cephei." It will be remembered that Mr. Lockyer has also seen the necessity for supposing more than one source of variation in many cases, and some of his examples of the peculiar curves produced by integrating two perfectly regular ones were given in our columns four years ago (NATURE, vol. xlii. p. 550). With Mr. Reed we regret that less attention has been given by observers to the character of the light-curves of these variables, than to the determination of the maxima and minima.

THE RADCLIFFE CATALOGUE.—The new star catalogue recently issued by Mr. Stone contains the positions of 6424 stars for the epoch 1890, deduced from observations made with the transit circle at the Radcliffe Observatory between January 1, 1881, and December 31, 1893. Up to 1887 a considerable number of observations were made for the determination of systematic errors of the instrument and for errors of the refraction tables. Since then the observations have been more exclusively directed to obtaining the positions of stars for well-distributed zero-points between the equator and N.P.D. 115°, in continuation and completion of the work carried out under Mr. Stone's direction at the Cape of Good Hope between the years 1870 and 1879. The catalogue gives the positions of all stars down to seventh magnitude between the equator and N.P.D. 115°, except those in clusters; of fainter stars to fill existing lacunæ; and of many stars of greater N.P.D. than 115° for comparison with the Cape catalogue of 1880. Many stars north of the equator are also included. The Cape catalogue and the present one together give a series of well-distributed zero-points for the whole southern hemisphere. With reference to future meridian work, Mr. Stone remarks: "From the facilities which photography affords for the rapid filling in of the positions of the fainter stars on a photographic plate, when those of a sufficient number of zero-points on the plate have been otherwise fixed, it would appear that the efforts of meridian observers will, for the future, be most advantageously directed to this class of stellar work." The catalogue includes estimates of proper motions as well as the usual constants, and there are also copious notes relating to the double and variable stars. The early appearance of a catalogue entailing such a vast amount of computation does great credit to the very limited staff of the observatory.

"L'ASTRONOMIE."—The decease of this monthly journal of popular astronomy is announced in the December number. For thirteen years M. Flammarion has conducted *L'Astronomie*, and has used it to popularise, and extend the study of, astronomical science, and now it dies from "difficultés d'administration." The Société Astronomique de France proposes to attempt to fill the gap by issuing their *Bulletin* monthly instead of quarterly, as heretofore.